

his own favourite expressions. He rapidly took in the lie and relation to one another of the rock masses. To this any geologist who has worked with him in the field can testify, and this is what lends its value to his classical memoir on the geology of North Wales, and to the maps and sections of which it is explanatory. But when he had sketched out the outlines of the history of the ancient volcanoes of that area, and had noted the choked craters now exposed by the denudation of the overlying masses of lava and cinder and mud, and when he had described the isolated portions of the volcanic and marine deposits which, building up mountains round the ancient roots of the volcano, still remained the record of great sheets that once spread continuously far and wide over the whole area; when he had done all this, he turned to another aspect of the question, and sought a clear answer to the inquiry how much rock, which we know surely once covered this area, has been removed by denudation? and we find in the same memoir sections illustrating the conclusions at which he had arrived.

For when "he had traced out the structure of a complicated geological region, and was able to show what should have been the form of the surface had it depended on geological structure," he was then "in a position to demonstrate how much material had been removed by denudation," namely, all that was above what he called the *Plain of Marine Denudation*, that is the old base level of ancient erosion, down to which all the agents of waste—rain, rivers, ice, and sea—had reduced the uplifted land; or perhaps, as we should now say, giving greater prominence to subaerial action, to the level at which the sea had arrested the work of the various agents that were reducing all dry lands to sea level.

Few men's work illustrates better than Ramsay's the place and value of a good "working hypothesis" in some kinds of higher scientific research. Imaginative and fertile in suggestion, no one was more sorry when further observations did not clearly support his first impressions, and he tried and tried and tried again to make it fit; yet he bowed always with deference to established evidence and logical consequence.

Besides his regular survey work, which was itself full of new observations and original treatment, and besides many papers giving the results of his researches on special points, he from time to time plunged into more speculative questions, and advanced some theory in explanation of the larger phenomena, especially those connected with surface configuration. For instance, reflecting on the great quantity of fine mud, "flour of rock," carried down by glaciers, and observing that ice was not, like water, restricted in its flow to continuous downward slopes, and holding that ice charged with stones would grind away more rock where the pressure was greater or the rock softer, he propounded the theory of the glacial erosion of rock basins.

His explanation is probably true in some cases, but he gave it a wider application than has been borne out by subsequent investigations.

Unfortunately he adduced as his first example the Lake of Geneva, a basin to which even those who agree with him upon the general probability of there being glacially eroded hollows such as his theory requires, would not now be prepared to apply it.

The public will read with profit and pleasure the biography of such a striking personality by a graceful and accomplished writer, who knew all about the man and his work, and had the skill to select with judgment and the good sense to keep the whole within the modest bounds of one volume of large print. Ramsay's many friends will love to have the record of his struggles and his triumphs, so many of which are told in his own words. Every survey man, not only of Great Britain, but throughout the world, will turn to this account of the commencement and growth of the geological survey of Great Britain, and cannot fail to profit by the insight it gives into the methods, life, difficulties, and results of that important branch of the public service.

So easily does the story run, that we cannot say whether the general reader, or the scientific student, will best appreciate this sketch of the progress of geological research through the most active and interesting half-century of its history.

OUR BOOK SHELF.

Harvard College by an Oxonian. By George Birkbeck Hill, D.C.L. (London: Macmillan and Co., 1894.)

DR. BIRKBECK HILL spent two months in 1893 in Cambridge, Massachusetts, and has compiled this little volume giving some account of the history of the celebrated college and university of Harvard. So far as Dr. Hill relies upon previous publications, his account is accurate, but his own observations and impressions are—as is very natural—often quite erroneous. Scant justice is done to the important and costly arrangements for the study of the various branches of the natural sciences which exist either at or in connection with the Massachusetts university. Dr. Hill is not fitted by his own education and experience to report on these matters, nor, indeed, can much value be attached to his somewhat antiquated standpoint as a critic or observer of university institutions. He contrasts Oxford and Harvard at every step, but he fails to give any picture or presentation of the real characteristics of the student's life at Harvard. He does not sufficiently emphasise the fact that the undergraduate at Harvard enjoys the immense benefit of true *university* education, at the hands of distinguished professors, with freedom and independence in regard to his choice and method of study, and as to such personal details of life as board and lodging; whereas the Oxford undergraduate is treated throughout his career as a goose to be nursed, monopolised and plucked by college ushers, who (owing to the system under which they are appointed) are, as a rule, as little capable of good teaching as they are of managing the domestic and disciplinary details of the collegeboarding-houses. Dr. Hill notes that the rage for athletics is almost as serious an injury to study at Harvard as it is at Oxford. L.

Tableau Métrique de Logarithmes. By C. Dumesnil. (Paris: Librairie Hachette and Co., 1894.)

THE use of logarithms for calculations is, as every one knows, a great saving of labour and time, and what otherwise would be complicated pieces of work are reduced to simple computations. The facility of working depends, after some time, on the good or bad arrangement of the tables, but instances often occur where much time is lost by having to turn pages backward and forward. For the case of logarithms to five places of decimals, M. Dumesnil has devised a means of eliminating altogether the use of tables, by adopting a series of scales neatly printed on stout sheets. From

these scales the divisions are so arranged that all the logarithms of the numbers from 1 to 10,000 can be easily read off, and *vice versa*. The scales, or tables as they are called, are published in two qualities. The cheaper are neatly and clearly printed, and on a smaller scale than the other; but, on the whole, we recommend the more expensive sheets, as the numbering is more easy to follow (coloured numbers being used), and the divisions are more legible on them.

To understand the method of working the tables is a matter of only a few minutes' attention, and when grasped, either the logarithm of a given number, or the number from a given logarithm, can be read off without the least hesitation. The book of instructions, which is separate from the tables, contains all that the user of the tables can require. The explanations are full and concise, and the worked-out examples will prove an excellent help in acquiring the methods of solution.

In the Guiana Forest. Studies of Nature in Relation to the Struggle for Life.

By James Rodway, F.L.S. With an Introduction by Grant Allen. Illustrated. (London: T. Fisher Unwin, 1894.)

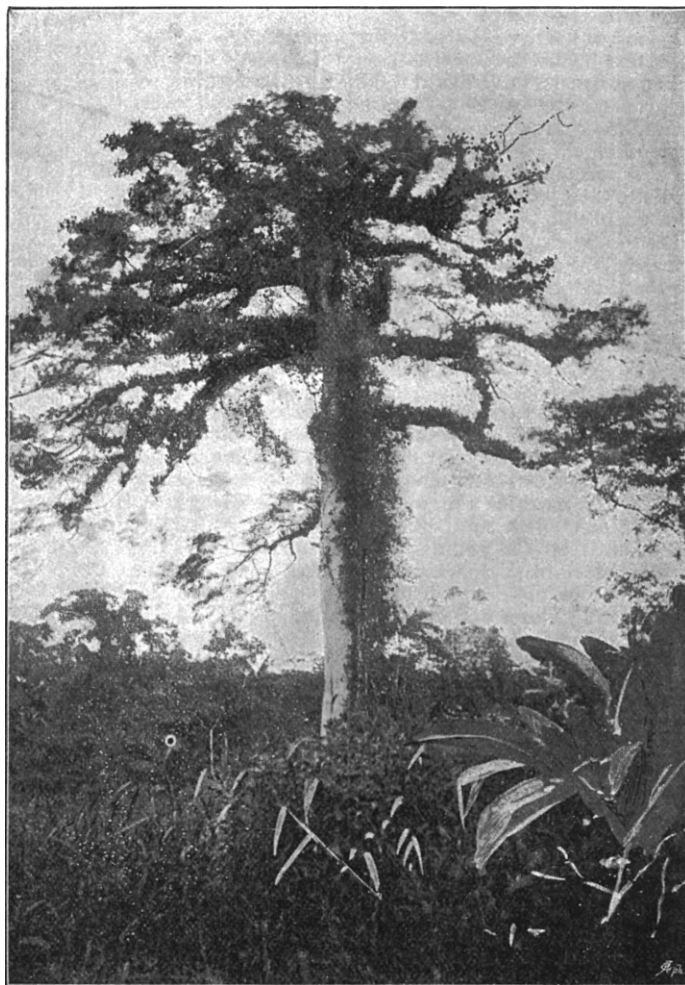
WE have read Mr. Rodway's book with a good deal of pleasure. Such a subject as the struggle for existence amongst the animals and plants of the Tropics, could not fail to be full of interest when dealt with by an enthusiastic lover of nature. For it is in the Tropics that nature's principal workshops are situated, and no naturalist can afford, nowadays, to neglect that essential element in a liberal biological education—a visit to these regions. There the struggle for life is no longer, as in our own climates, a cold-blooded process which only a trained eye can follow, but a fiercely active competition for the means of subsistence which is everywhere apparent in every detail of the structure of the individual and of the economy of the species. The "heartless vegetable" amid such surroundings seems no longer a reality, but the cold figment of a northern imagination.

Mr. Rodway describes the vegetation of the forest, the swamp, the sand-reef, and the sea-shore, and each is sketched in vigorous outline. One cannot, however, avoid wishing that the author had been contented to give his impressions of the actual facts, without indulging in metaphysical moralising which is not scientific, and is not always common sense. Occasionally, too, he gives way to great prolixity, as, for instance, in an excursus on the interdependence of animals and plants, which is all very like something we have heard before, only that Mr. Rodway's story is longer. The author is on dangerous ground when he ventures to dip into the philosophy of natural selection, or to deal with problems of variation.

But notwithstanding these defects, the book is worth reading. It is well illustrated, and contains a large amount of really interesting observation which may stimulate the general reader, and which will recall many a half-forgotten scene to those who have themselves been travellers. The accompanying illustration, for which we are indebted to the publisher, shows a silk cotton-tree crowded with epiphytes.

Lehrbuch der Experimentalphysik. Von A. Wüllner. Band i. 5te Aufl. (Leipzig: Teubner, 1895.)

STUDENTS who wonder when we are to have an English treatise on experimental physics worthy of comparison with this well-known German one (and the French text-books of Jamin and Violle), will find food for reflection in the fact that thirteen years have elapsed since the last edition of Wüllner (the fourth) was published. Much the same thing holds good of other German scientific treatises, notwithstanding that publishing firms of repute in the Fatherland do not consider it beneath their dignity to quicken the sale of the remnant of an edition by having notices posted up in the



Universities intimating that *bonâ fide* students of the subject can secure copies at a reduced price by application through the University Professor.

In the present case the interval has been well employed. The first volume has grown to 1000 pages—or 150 more than in the fourth edition—and the most important researches published up to the end of 1892 have been incorporated. In the last edition the article on internal friction contained simply a discussion of torsional vibrations and logarithmic decrement, followed by a page in which mention was made of the researches of Schmidt and others, with a statement of the conclusion arrived at, viz. that in such elastic oscillations the